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Out-of-pocket expenditure on institutional delivery in India

Sanjay K Mohanty[1]* and Akanksha Srivastava[2]

[1]Department of Fertility Studies, International Institute for Population Sciences, Mumbai, India and [2]Research Scholar, International Institute for Population Sciences, Mumbai, India

*Corresponding author. Associate Professor, Department of Fertility Studies, International Institute for Population Sciences, Govandi Station Road, Deonar, Mumbai - 400088, India. E-mail: sanjayiips@yahoo.co.in, sanjay@iips.net

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Context Though promotion of institutional delivery is used as a strategy to reduce maternal and neonatal mortality, about half of the deliveries in India are conducted at home without any medical care. Among women who deliver at home, one in four cites cost as barrier to facility-based care. The relative share of deliveries in private health centres has increased over time and the associated costs are often catastrophic for poor households. Though research has identified socio-economic, demographic and geographic barriers to the utilization of maternal care, little is known on the cost differentials in delivery care in India.

Objective The objective of this paper is to understand the regional pattern and socio-economic differentials in out-of-pocket (OOP) expenditure on institutional delivery by source of provider in India.

Methods The study utilizes unit data from the District Level Household and Facility Survey (DLHS-3), conducted in India during 2007–08. Descriptive statistics, principal component analyses and a two-part model are used in the analyses.

Findings During 2004–08, the mean OOP expenditure for a delivery in a public health centre in India was US$39 compared with US$139 in a private health centre. The predicted expenditure for a caesarean delivery was six times higher than for a normal delivery. With an increase in the economic status and educational attainment of mothers, the propensity and rate of OOP expenditure increases, linking higher OOP expenditure to quality of care. The OOP expenditure in public health centres, adjusting for inflation, has declined over time, possibly due to increased spending under the National Rural Health Mission. Based on these findings, we recommend that facilities in public health centres of poorly performing states are improved and that public–private partnership models are developed to reduce the economic burden for households of maternal care in India.

Keywords Out-of-pocket expenditure, cost of delivery, institutional delivery, India

KEY MESSAGES

- The mean out-of-pocket (OOP) expenditure on a normal delivery in a public health centre was US$28 compared with US$84 in a private health centre, and that for a caesarean delivery was about three times higher than for normal delivery.
- The cash incentives under the Jananai Suraksha Yojana (JSY) scheme to promote institutional delivery are significantly lower than the OOP expenditure in a private health centre.
- During 2004–08, the mean OOP expenditure on delivery care at public health centres declined, indicating that increased public spending (National Rural Health Mission) reduces the economic burden on the household of maternal care.
- The ability to pay and doctor–population ratio are significant determinants of institutional delivery in India.

Introduction

In the last decade, India has made tangible progress in reducing maternal and neonatal mortality. The maternal mortality ratio (MMR) has declined from 398 (per 100 000 live births) in 1997–98 to 212 in 2007–09, and the neonatal mortality has declined from 45 (per 1000 live births) to 34 during the same period (ORGI 2006a; ORGI 2009; ORGI 2011a; ORGI 2011b). The reduction in maternal and neo-natal mortality is associated with an increase in institutional delivery (delivery in a health centre), from 26% in 1992–93 (IIPS and Macro International 1995) to 47% in 2007–08 (IIPS 2010). However, this increase masks large differentials among the socio-economic groups and states of India.

Studies have identified a number of supply- and demand-side factors that act as barriers to the utilization of delivery care in India. The supply-side factors mainly include the availability of and accessibility to a health facility, presence of a lady medical doctor and availability of drugs (Rama Rao 2001; Navaneetham and Dharamalingam 2002; IIPS 2010); the demand-side factors are maternal education, economic status of household, caste and religion (Bhatia and Cleland 1995; Singh and Singh 2007; Mohanty and Pathak 2009; Kesterton *et al*. 2010; Mohanty 2011). Further, community attributes and programme-related factors play a critical role in the utilization of delivery care (Stephenson and Tsui 2002). Though the cost of health services and the household's ability to pay for health services (economic factors) are major obstacles to the utilization of facility-based delivery (Bhatia and Cleland 1995; Griffiths and Stephenson 2001; Nanda 2002), there are a limited number of studies that have explored the socio-economic differentials in cost of delivery care services.

Unlike developed countries, health expenditure in India is largely met by the households (71%), followed by government (20%), businesses (6%) and external flows (2%) (MOHFW 2009). Often household health expenditure, termed as out-of-pocket (OOP) expenditure, is catastrophic for poor households and increases the level of poverty (Garg and Karan 2009). Studies have shown that poor households in India are more likely to finance health care through borrowing and sale of assets than wealthier households (Peter *et al*. 2001). Catastrophic health spending is incurred not only for general health services but also for maternal health services. A few studies have documented that expenditure on delivery care is catastrophic for rural households, the less educated, slum dwellers and poor households (Bonu *et al*. 2009; Skordis-Worrall *et al*. 2011). The poorest households are heavily burdened by spending on maternal care and often resort to borrowing to meet expenses (Skordis-Worrall *et al*. 2011).

Although reproductive and child health (RCH) services are provided for free or at nominal cost in public health centres in India, deliveries in private health centres have increased over time. While the percentage of deliveries in public health centres has increased from 15% in 1992–93 to 18% in 2005–06, the percentage in private health centres has risen from 11% to 20% (IIPS and Macro International 2007). Some researchers have observed that delivery services at public health centres are inferior, so with an increase in income people prefer to use private health centres (Skordis-Worrall *et al*. 2011). The increase in the utilization of maternal care from private health centres may be attributed to an array of factors: better quality of care and accessibility of private health centres, non-availability of health services and drugs at public centres, and improvement in the standard of living of the population.

To improve the availability of and accessibility to quality health services in public health centres, the Government of India has launched a number of policy directives, such as higher budgetary allocation under the National Rural Health Mission (NRHM), introduction of the Janani Suraksha Yojana (JSY) scheme and accreditation of private providers (for cashless access). The NRHM is the largest flagship programme of the central government with the goal of providing quality health services to the masses, in particular poor, marginalized women and children (MOHFW 2005). Similarly, the JSY is a 100% centrally sponsored scheme (under NRHM) that integrates cash assistance with delivery and post-delivery care. It was launched to promote facility-based delivery, specifically among poor and marginalized women. The cash incentives vary between high-focus and low-focus states and for rural and urban areas (MOHFW 2006). Though the NRHM was launched in 2005, about half of mothers do not use the delivery care services and a substantially higher proportion cite cost as a major impediment to use.

Globally, the number of studies on the cost of RCH services is limited, though their necessity has been largely acknowledged. This is mainly because of the complexity involved in the cost estimation. RCH services are provided by various sources such as government and private health centres, non-government organizations (NGOs), charitable trusts, etc., and the user charges vary significantly by type of pregnancy (normal/caesarean), pregnancy complications and government policies.

Generally, three approaches are used to determine the cost of RCH services: cost to public and private providers, total cost of a reproductive health programme and cost to households (Mitchell *et al*. 1999). The household costs are broadly categorized as direct costs and indirect costs. While the direct costs include registration fees, delivery fee, bed charges, laboratory tests, food, drugs, tips and transport fees, the indirect costs include loss of wages/salaries, manpower days lost and opportunity cost. Though the concept of cost should include all direct and indirect costs and subsidies in the form of government spending, in practice this concept is mainly used to reflect the OOP expenditure incurred by the end user.

Studies on OOP expenditure on delivery care have found significantly higher cost of services for caesarean delivery, complicated pregnancy and for deliveries at private health centres. Perkins *et al*. (2009) estimated that the OOP cost of a normal delivery was US$14.2 in Kenya, US$6.6 in Burkina Faso and US$4.5 in Tanzania. The costs were significantly higher for a complicated delivery and delivery at a private health centre. Levin *et al*. (2000) studied the cost of maternity care in three African countries: Ghana, Malawi and Uganda. They found that the unit cost of antenatal care was US$2.21–6.4 in Uganda, US$3.2–5.8 in Malawi and US$3.0–5.5 in Ghana, and that obstetric complications were more expensive, ranging from US$ 29.4 to US$ 159.7 in the three countries. Kowalewski *et al*. (2002) examined the user cost of antenatal consultation, antenatal hospitalization and delivery care services in rural Tanzania by reviewing maternity care documents, key informant interviews and structured interviews. The average cost was US$11.6 for an antenatal consultation, US$25.1 for a normal delivery and US$135.4 for a caesarean section at the hospital.

In Bangladesh, the mean cost of a normal delivery was US$17.5 and that of a caesarean delivery was US$31.9 in 1995. The free maternity care in the public sector involved hidden costs, such as registration fees, purchase of drugs, food costs, tips and transport costs (Nahar and Costello 1998), and was unaffordable for poor women (Afsana and Rashid 2001). In 2003, the average cost of a normal delivery at a health facility in Nepal was US$8.97 and that of a home delivery was US$5.4 (Borghi *et al*. 2006). Bonu *et al*. (2009) estimated that the average cost of delivery in a public health centre in India was US$24.7 compared with US$104.3 in a private health centre. Studies have also suggested that informal fees in India are five times higher than the formal fees (Sharma *et al*. 2005).

In India, we have periodic information on the socio-economic differentials in institutional delivery at the sub-national level, but little is known of the cost differentials of delivery by household and provider characteristics. This is due to the absence of reliable information on the cost of services in large-scale population-based surveys. For the first time, the District Level Household and Facility Survey (DLHS-3) collected information on the cost of delivery care from women who delivered 5 years preceding the survey. Using the unit data of the DLHS-3, this study explores the socio-economic and regional differentials in OOP expenditure on delivery care by type of health care provider in India. We use the terms out-of-pocket expenditure and cost of delivery (payment made by the end user only) interchangeably.

Objectives and rationale

The specific objectives of the paper are:

(1) To examine the inter-state variations in OOP expenditure on delivery care in public and private health centres in India;
(2) To examine the socio-economic differentials in OOP expenditure on delivery care in public and private health centres in India.

The paper has been conceptualized with the following rationale. First, a substantial proportion of women in India report cost as one of the main reasons for not using delivery care services. Second, the utilization of delivery services from private health centres has increased over time. This increase is observed across socio-economic groups and areas, although the cost of services in the private sector is significantly higher than in the public sector and is often catastrophic. Third, there are a limited number of population-based studies that describe the socio-economic differentials in OOP expenditure on delivery care though health inequality research has significantly contributed to our understanding on the determinants of health services utilization. Fourth, it is interesting to know whether the large investment in reproductive health care under the NRHM had reduced the cost for end users. With limited resources, the financial implications of reproductive health services are of great interest to policy makers and programme managers.

Data and methods

Data

The study utilizes the unit data from the DLHS-3 on reproductive and child health, which was conducted during 2007–08. The DLHS-3, the third in a series of population-based surveys, was designed to provide reliable information on monitoring indicators of reproductive and child health in the districts of India. The DLHS-3 used different structured questionnaires for the household, ever-married women and unmarried women. In addition, information on the village and on health facilities (sub-centre, primary health centre, and community health centre and district hospital) was collected in separate questionnaires.

The household questionnaire provides information on age, sex and education of each household member, housing conditions, sanitation facilities, size of landholding, consumer durables, caste and religion. The questionnaire for ever-married women provides detailed information on age, educational attainment, children ever born and children surviving of ever-married women in the age group 15–49 years. Detailed information on antenatal care, delivery care and immunization, transportation cost and cost of delivery of last births in the 5 years preceding the survey was collected from ever-married women. The survey had only two questions on the cost of delivery care. First, ''*how much did it cost you for the transportation to the health facility for delivery?*'' This query was posed to those women who had delivered at a health centre. Second, ''*how much cost did you incur for delivery excluding transport cost?*'' This was asked to all women irrespective of the place of delivery. No specific information on

doctors' fees, money spent on medicine, bed etc. was collected, so it was not possible to segregate these costs. A small proportion of women reported that they did not know the cost of the delivery and they are excluded from our analyses.

A total of 720 320 households and 643 944 ever-married women aged 15–49 were covered in the survey. Both the household data and the data on ever-married women are used in our analyses. The national weight is used for national level analyses and a state weight is used for state level analyses. The differentials in the cost of delivery care for major states of India are analysed. Further, we compute a doctor–population ratio by using the number of allopathic doctors registered under the state medical council as of 2008 (Central Bureau of Health Intelligence, Government of India, 2008) and mid-year population of 2008 (ORGI 2006b). We also utilize the information on per capita public expenditure on health from the National Health Accounts 2004–05 (MOHFW 2009) and the state domestic product per capita from the Economic Survey, 2008–09 (Ministry of Finance 2009) in the analyses.

Methods

We termed cost of delivery (as reported in the survey) as OOP expenditure and it was used as a dependent variable in the analyses. The differentials in OOP expenditure on delivery care are analysed with respect to demographic and socio-economic characteristics of women, type of health care provider and delivery characteristics. Demographic factors include age of the woman, birth order and place of residence; socio-economic characteristics include educational attainment of the woman and wealth quintile of the household. The delivery characteristics are type of delivery (normal/caesarean) and pregnancy complications, while the providers are categorized as public and private. Descriptive analyses and multivariate techniques are used to understand the differentials and determinants of delivery care. Data on the cost of maternal care were collected for last delivery over a 5-year period (2004–08). As the price level varies over time, we have adjusted the cost to 2004 prices (constant prices) using the Whole Sale Price Index (Ministry of Finance 2009). While the cost for the year 2004 is constant, it has been deflated by 0.96, 0.91, 0.87 and 0.81 for the years 2005, 2006, 2007 and 2008, respectively. The increase in the general price level was 4% between 2004 and 2005, 10% between 2004 and 2006, 15% between 2004 and 2007, and 25% between 2004 and 2008. All the estimates are presented in US$ for international comparability.

We computed the mean cost of delivery and the coefficient of variation by states and individual characteristics of women to understand the differentials in cost of maternity care. The t test is used to examine the statistical significance in the mean cost by different groups. A log-linear regression model is used to understand the significant predictors of OOP expenditure and institutional delivery in the states. Principal component analysis (PCA) is used to construct a wealth index based on household amenities, housing quality, size of land holdings and a set of consumer durables. This is done separately for rural and urban areas as the health estimates differ significantly when rural and urban specification of variables is made against a single wealth index at the national level (Mohanty 2009). The wealth index is categorized into five quintiles and used as a proxy for economic status of the households.

To understand the significant predictors of cost of delivery, a two-part model is used. The two-part model is an analytical model in which the first step is modelling the probability of a household incurring expenditure on delivery using the logit model. The dependent variable is binary, that is in the form of 0 and 1, where '0' represents those who reported no cost of delivery and '1' represents those who had incurred any expenditure on delivery care. The independent variables include age of the mother, birth order, sex of the child, place of residence, educational level of the woman and wealth quintile of the household. In the second step, ordinary least squares (OLS) regression was carried out for those who had incurred any expenditure on delivery. In OLS, the dependent variable log (cost of delivery) was regressed against the same set of independent variables. The two-part model is best suited for analyses when the outcome variable (expenditure incurred on delivery care) has a significant proportion of zero values and the distribution is skewed (Deb *et al*. 2006; Matsaganis *et al*. 2008).

Results

A schematic presentation of ever-married women interviewed, births and place of delivery is presented in Figure 1. A total of 218 058 sampled women had given birth since 1 January 2004, of which 54 804 births were at public health centres and 39 807 births were at private health centres.

Public spending, doctor–population ratio, state domestic product per capita and OOP expenditure on delivery care in India

Figure 2 shows the state domestic product per capita (SDPP) and the OOP expenditure on delivery care for the major states of India. The SDPP is the proxy of per capita income, while OOP expenditure is the cost to the household for delivery. The states with higher SDPP tend to have higher mean OOP expenditure. For example, the states of Kerala, Maharashtra and Gujarat, with higher SDPP, tend to have higher OOP expenditure, whereas Bihar, with the lowest SDPP, had the lowest OOP expenditure on delivery care.

We also plot the mean OOP expenditure in public health centres against the percentage of deliveries in these centres, and the mean OOP expenditure in private health centres against their percentage of deliveries, in order to understand the cost differentials in institutional delivery (Figures 3 and 4). There is a diversified pattern in OOP expenditure in the public and private health centres in India. Of note, about half of the deliveries in Tamil Nadu were conducted at public health centres and the mean OOP expenditure was lower than in poorly performing states of Uttar Pradesh and Bihar. The low expenditure in Tamil Nadu is likely to be the result of better resourcing of facilities (availability of drugs, doctors and nurses). Also, health is a state matter and the charges for drugs, registration fees and other charges vary between states. Studies have documented that the unofficial charges paid to staff in public health centres lead to higher OOP expenditure in

public health centres (Sharma *et al*. 2005; Skordis-Worrall *et al*. 2011).

During the survey, information on place of delivery was collected from the ever-married women for their last birth since 1 January 2004. The place of delivery was categorized into government health centre (hospital, dispensary, urban health centre/urban health post, community health centre/rural hospital, primary health centre, sub-centre), private health centre (hospital/clinic, Ayush/hospital/clinic), NGO/trust hospital/clinic, at home/parents home, work place and others. For the purpose of analysis, we have combined these into three categories, namely, deliveries at public health centres, deliveries at private health centres (including NGOs/trusts) and others. Table 1 shows the medical assistance at delivery by source of provider, the mean OOP expenditure on delivery, state domestic product per capita (SDPP), registered number of allopathic doctors per 100 000 population and per capita public expenditure on health for the states of India.

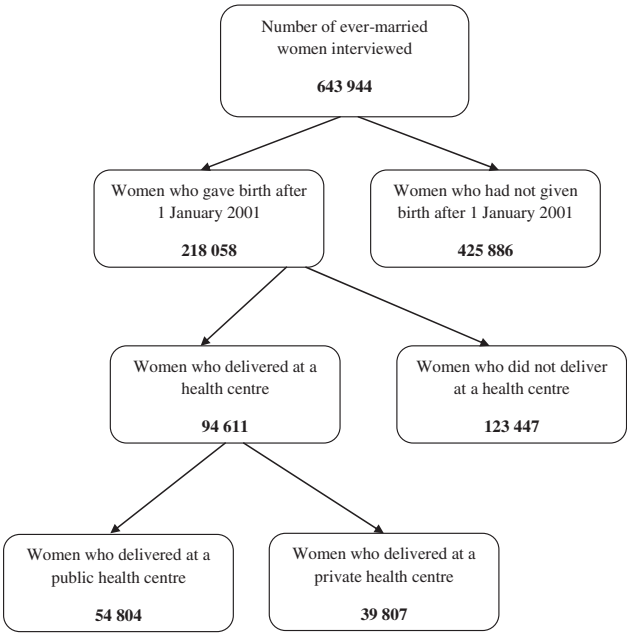

Figure 1 Schematic presentation of ever-married women sample in DLHS-3, India, 2004–08

It was found that about 26% of deliveries in India were conducted at public health centres, 21% were conducted at private health centres, 6% were conducted at home with skilled birth attendants and 48% delivered at home without any medical assistance. In all, 52% of deliveries were medically assisted (also called safe deliveries) and 48% were unsafe. The proportion with medical assistance at delivery varies considerably among the states. The majority of the deliveries in the states of Assam, Bihar, Chhattisgarh, Jharkhand and Uttar Pradesh were conducted at home without any medical assistance. On the other hand, almost all the deliveries in the states of Kerala and Tamil Nadu were conducted with medical assistance. The proportion of deliveries at private health centres varies greatly among the states, being lowest in Jammu & Kashmir followed by Chhattisgarh and Orissa, and highest in Punjab followed by Andhra Pradesh and Tamil Nadu. The proportion of deliveries at private health centres was higher than that of deliveries in public health centres in the states of Andhra Pradesh, Bihar, Gujarat, Haryana, Jharkhand, Kerala, Maharashtra, Punjab and Uttar Pradesh. The mean OOP expenditure on a delivery was US$44 (2004 prices); with the maximum in Kerala (US$149) and the minimum in

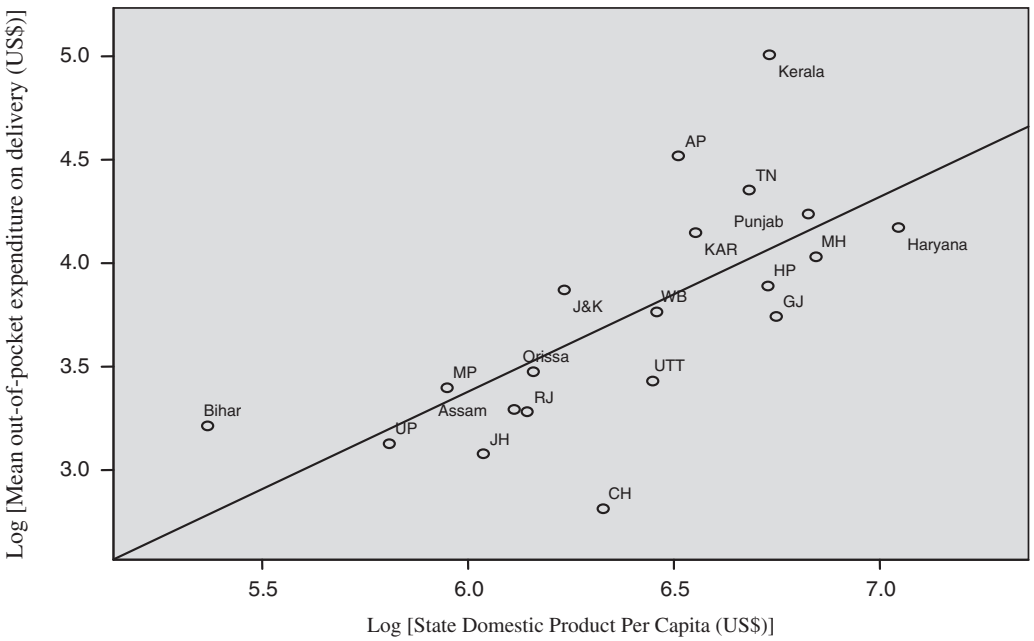

Figure 2 State domestic product per capita (Log) and mean out-of-pocket expenditure (Log) on delivery care in India (2004 prices)
Note: AP = Andhra Pradesh; CH = Chhattisgarh; HP = Himachal Pradesh; JH = Jharkhand; J&K = Jammu & Kashmir; KAR = Karnataka; MH = Maharashtra; MP = Madhya Pradesh; RJ = Rajasthan; TN = Tamil Nadu; UP = Uttar Pradesh; UTT = Uttarakhand; WB = West Bengal.

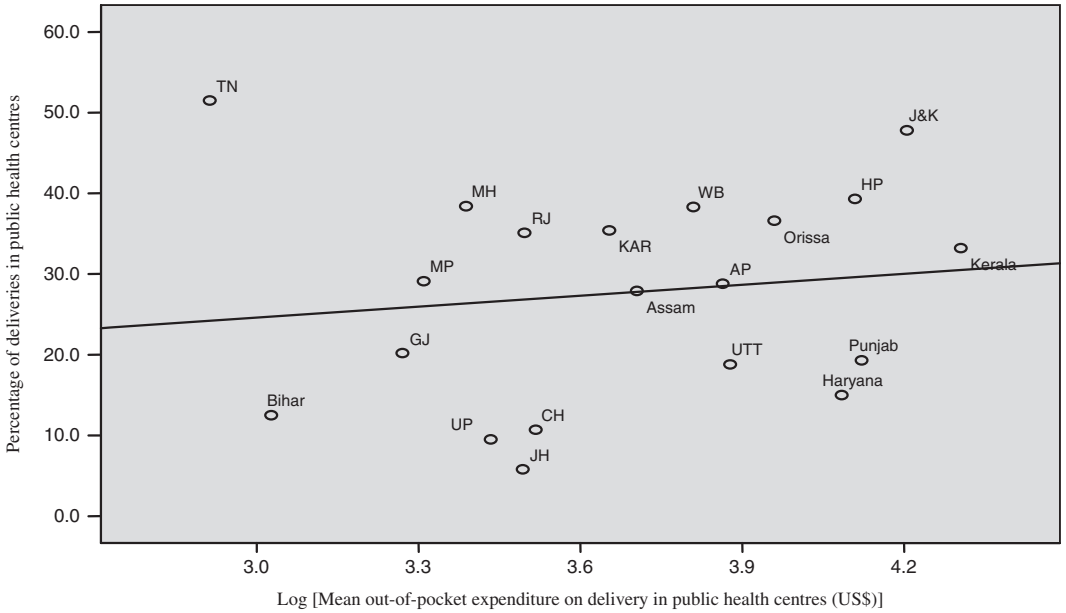

Figure 3 Mean out-of-pocket expenditure (Log) on delivery care in a public health centre and percentage of deliveries in public health centres in India (2004 prices) *Note*: AP = Andhra Pradesh; CH = Chhattisgarh; HP = Himachal Pradesh; JH = Jharkhand; J&K = Jammu & Kashmir; KAR = Karnataka; MH = Maharashtra; MP = Madhya Pradesh; RJ = Rajasthan; TN = Tamil Nadu; UP = Uttar Pradesh; UTT = Uttarakhand; WB = West Bengal.

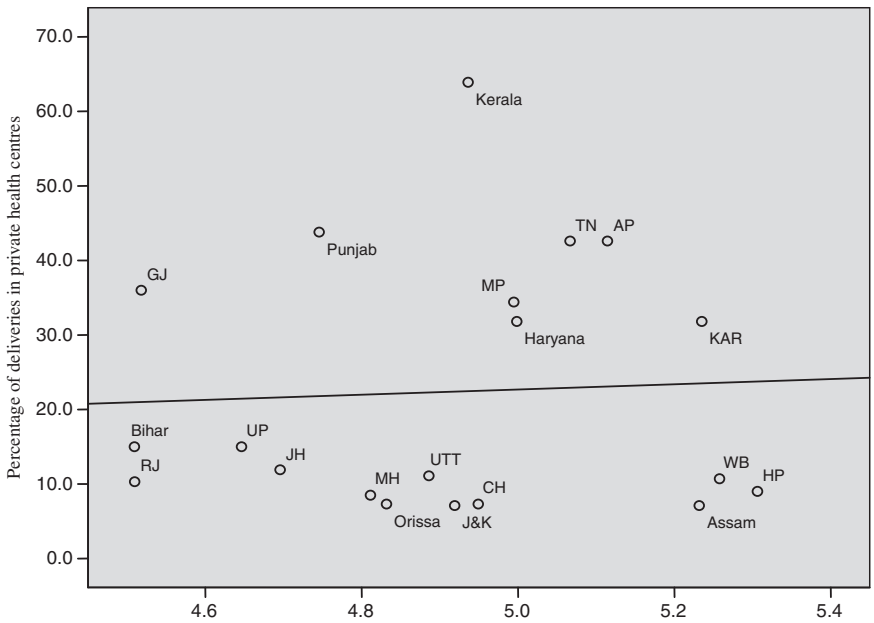

Figure 4 Mean out-of-pocket expenditure (Log) on delivery care in a private health centres and percentage of deliveries in private health centres in India (2004 prices) *Note*: AP = Andhra Pradesh; CH = Chhattisgarh; HP = Himachal Pradesh; JH = Jharkhand; J&K = Jammu &Kashmir; KAR = Karnataka; MH = Maharashtra; MP = Madhya Pradesh; RJ = Rajasthan; TN = Tamil Nadu; UP = Uttar Pradesh; UTT = Uttarakhand; WB = West Bengal.

Chhattisgarh (US$17). We observed that, among other things, the mean OOP expenditure was positively associated with SDPP, registered number of doctors per 1 lakh (100 000) population and per capita public expenditure on health. The correlation coefficient of institutional delivery with number of registered allopathic doctors is 0.81; with SDPP it is 0.4 and with per capita public expenditure on health it is 0.3.

Supply-side factors have a strong bearing on institutional delivery. For example, the number of allopathic doctors registered with the state medical council per 1 lakh population

Table 1 Percentage of deliveries by source of provider, mean out-of-pocket (OOP) expenditure on delivery, state domestic product per capita (SDPP), doctor–population ratio and per capita public health expenditure in the states of India

States	Percentage of deliveries				*N*	Mean OOP expenditure on a delivery (US$)	SDPP[1] (US$)	Registered allopathic doctors per one lakh population[2]	Per capita public expenditure on health, 2004–05[3] (US$)	Percentage of women who experienced pregnancy complications
	Public hospital	Private hospital	Attended by SBA	Not assisted by health professional and conducted at home						
Andhra Pradesh	28.8	42.6	4.1	24.5	5165	92	675	66	4	46.5
Assam	27.9	7.1	5.4	59.7	10 079	27	453	59	4	41.1
Bihar	12.5	15.0	4.4	68.1	21 668	25	215	40	2	51.0
Chhattisgarh	10.7	7.3	11.6	70.4	6234	17	563	8	3	44.7
Gujarat	20.2	36.0	5.6	38.2	7610	42	857	76	4	35.2
Haryana	15.0	31.8	6.5	46.7	6927	65	1153	14	4	52.1
Himachal Pradesh	39.3	9.0	2.8	49.0	2595	49	840	–	14	40.6
Jammu & Kashmir	47.8	7.1	4.0	41.1	5235	48	512	89	11	38.7
Jharkhand	5.8	11.9	7.3	75.1	11 480	22	421	5	3	53.9
Karnataka	33.2	31.8	6.8	28.1	7738	63	704	136	5	30.7
Kerala	35.4	63.9	0.0	0.7	3339	149	843	110	6	50.0
Madhya Pradesh	38.4	8.5	3.1	50.1	16 124	30	385	47	3	46.3
Maharashtra	29.1	34.4	5.9	30.6	10 442	56	944	89	5	41.2
Orissa	36.6	7.3	7.1	49.0	7791	32	475	40	4	37.7
Punjab	19.3	43.8	13.9	23.0	5738	69	926	141	5	24.6
Rajasthan	35.1	10.3	7.3	47.4	12 589	27	468	41	4	45.7
Tamil Nadu	51.5	42.6	1.6	4.3	6573	78	802	121	5	38.7
Uttar Pradesh	9.5	15.0	5.8	69.8	37 978	23	335	27	3	50.2
Uttarakhand	18.8	11.1	5.4	64.8	4169	31	635	–	6	44.7
West Bengal	38.3	10.7	2.6	48.4	6526	43	641	65	4	51.3
India	26.4	20.5	5.6	47.5	217 999	44	671	89	5	45.6

Notes: – data not available. SBA = skilled birth attendant.

[1] Economic Survey 2008–09, Ministry of Finance, Government of India.

[2] Computed using data on allopathic doctors registered with the state council from the Central Bureau of Health Intelligence, Government of India, 2008, and Population Projections for India and states 2001–26, Office of the Registrar General and Census Commissioner, India, 2006b. One lakh = 100 000.

[3] National Health Accounts 2004–05.

was highest in Punjab followed by Karnataka and Tamil Nadu, and lowest in Jharkhand followed by Chhattisgarh, Haryana and Uttar Pradesh. Also, the per capita public expenditure on health was highest in Himachal Pradesh and lowest in Bihar. To understand the relationship of OOP expenditure and percentage of institutional deliveries with SDPP, doctor–population ratio and public expenditure per capita on health, we use the log-linear regression model (Table 2). All the dependent and independent variables are in logarithmic scale (natural base) and the coefficients are interpreted as percentages. We found that mean OOP expenditure on delivery care is positively and significantly associated with SDPP, indicating that OOP expenditure increases with an increase in income level. The regression coefficient of 0.7 indicates that a 10% increase in SDPP is likely to increase OOP expenditure on delivery care by 7%. Thus OOP expenditure depends on the ability to pay, a finding in keeping with that of earlier studies (Roy and Howard 2007). However, on regressing institutional deliveries with doctor–population ratio, per capita public health expenditure and SDPP, we found that the doctor–population ratio is a significant predictor of institutional delivery. The regression coefficient of 0.4 indicates that if we double the doctor–population ratio in a state, it will lead to a 40% increase in institutional delivery, keeping other factors constant. The coefficient of per capita public expenditure on health is not statistically significant ($t = 0.6$). From these results, we may infer that health manpower is a critical determinant of institutional delivery in India.

The average OOP expenditure at the state level masks large differentials in cost among private and public health centres and by type of delivery. Studies have documented higher fees in private health centres compared with public health centres and for caesarean deliveries. Appendix 1 shows the mean OOP expenditure on delivery at public and private centres by type of delivery (normal/caesareans). We have four general observations. First, the mean OOP expenditure in private health centres in India is at least three times higher than in public health centres. Results are robust across the states and the public–private cost differentials are statistically significant ($p < 0.01$). Second, the mean OOP expenditure for a caesarean delivery is

Table 2 Regression results for out-of-pocket (OOP) expenditure on delivery and percentage of institutional deliveries in states of India, 2004–08

Dependent variable	Independent variable	Regression coefficient	T-Statistics	R^2	*N*
Log (OOP expenditure)	Log (SDPP)	0.7	2.9	0.7	18
	Log (Per capita public health expenditure)	0.2	0.6		
	Log (Registered allopathic doctors per 1lakh population)	0.3	2.6		
Log (institutional deliveries)	Log (SDPP)	0.3	1.7	0.8	18
	Log (Public health expenditure)	0.1	0.3		
	Log (Registered allopathic doctors per 1 lakh population)	0.4	4.7		

Notes: SDPP = state domestic product per capita. 1 lakh = 100 000.

about four times higher than that for a normal delivery, and the cost tends to be catastrophic for poor and marginalized populations. Third, there is no significant difference in transportation costs to public and private centres (US$7 each). This indicates that there is little difference in the accessibility of private and public health centres in many parts of the country, and that private and public centres co-exist. However, there are significant differences in the cost of transportation by place of residence and state. The cost of transportation for rural women is almost twice as high as that for urban women and it is highest for the state of Chhattisgarh (not shown). Fourth, the coefficient of variation in mean cost varies largely across the states by type of provider, indicating the variability in OOP expenditure on delivery care.

To understand the differentials in cost at public and private health centres, we computed the ratio of OOP expenditure incurred in private health centres to that for public health centres (Figure 5). The closer the ratio of OOP expenditure to 1 (private to public), the lesser the differential in cost between private and public health centres. On average, a normal delivery in a private health centre in India costs three times more than in a public health centre. The ratio is highest in the state of Tamil Nadu (6.8) and lowest in the state of Punjab (1.6). Although OOP expenditure at public health centres is lowest in Tamil Nadu, it is significantly higher in private health centres, indicating that the public facilities charges only nominal prices for basic health care.

Socio-economic and demographic differentials in OOP expenditure on delivery care

The average OOP expenditure masks wide differences across socio-economic and demographic groups. We present these differentials under three sub-sections: economic differentials, social differentials and demographic differentials. Results are presented for India and the states of Uttar Pradesh and Tamil Nadu. The national average reflects the OOP expenditure for all the states and union territories of India, while the states of Uttar Pradesh and Tamil Nadu are selected based on the level of institutional deliveries. The coverage of institutional delivery is high in Tamil Nadu and the associated cost in a public health centre is the lowest in the country. In the case of Uttar Pradesh, the coverage of institutional delivery and the associated cost is lower than in many other states. Further, these states differ significantly with respect to key economic, social and cultural factors.

Economic differentials in OOP expenditure

To understand the economic differentials in OOP expenditure, we present OOP expenditure by wealth quintiles, possession of a Below Poverty Line card (BPL), JSY beneficiaries and those who borrow money to pay for delivery care. We rely on the wealth quintile, the proxy of economic status, as no direct economic measures are collected in the DLHS-3. While studies have documented the increasing economic inequality in the utilization of delivery care (disadvantageous to the poor), less is known about OOP expenditure across economic groups.

We found that OOP expenditure in India increases with an increase in the economic status of women, irrespective of place of delivery (Figure 6). This is because economically better-off mothers demand better quality services and have the ability to pay for the services (affordability). For example, among mothers who delivered in public health centres, the average OOP expenditure varied from US$27 in the poorest wealth quintile to US$54 in the richest wealth quintile. The pattern is similar among those mothers who delivered in private health centres. On average, mothers in the richest quintile pay twice what mothers in the poorest quintile pay. However, a significant proportion of poor women seek care in private health centres, for multiple reasons (poor quality of care in public health centres, non-availability of facilities, emergency, etc.), and the average cost in private health centres is about three times higher than in public health centres. The pattern observed for both Uttar Pradesh, Tamil Nadu and holds true at the national level, indicating that household economic condition is a key determinant of OOP expenditure.

We found that OOP expenditure is significantly lower among JSY beneficiaries compared with non-JSY beneficiaries (delivering in public health centres). This is because JSY beneficiaries are more likely to be in the poorer section of the population (Table 3). Although JSY beneficaries pay less than non JSY beneficiaries in private health centres, the charges in private health centres are substantially higher than the cash incentives received by them. The pattern is similar with respect to those who were identified as poor by the central and state governments and given the BPL card. Women belonging to BPL families spent less than those in non-BPL families and women who borrowed money spent more compared with those who did not.

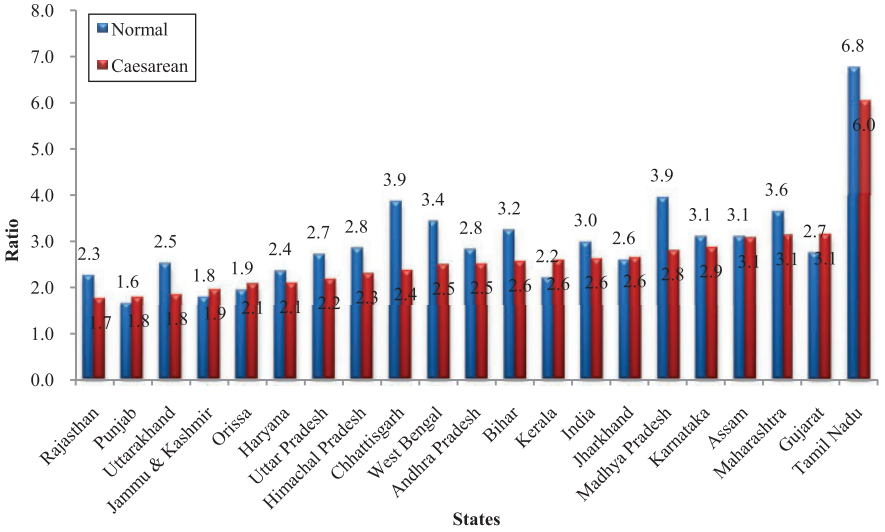

Figure 5 Ratio of mean out-of-pocket expenditure in private and public health centres for a normal and caesarean delivery in India, 2004–08

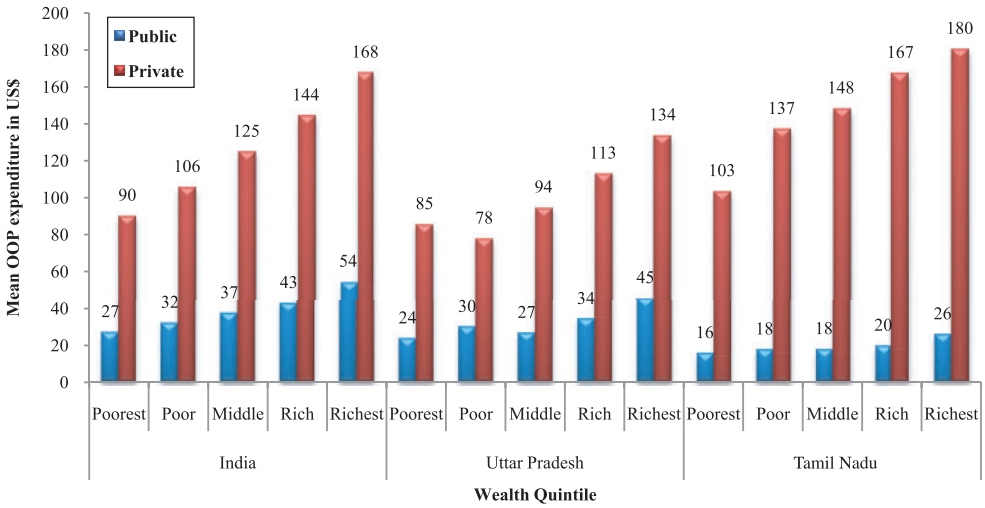

Figure 6 Mean out-of-pocket expenditure (US$) on delivery by wealth quintile in public and private health centres in India, Uttar Pradesh and Tamil Nadu, 2004–08

Social differentials in OOP expenditure

We present the social differentials in OOP expenditure by educational attainment and caste of women (Figure 7 and Table 3). As with wealth quintiles, OOP expenditure increases with the educational attainment of women (both for public and for private health centres). For example, for mothers delivering in a public health centre, the mean OOP expenditure for those with no education was US$30 compared with US$57 for those who had intermediate and above education. Similar differences have been observed in private health centres. The pattern was similar across the states. The differentials in OOP expenditure by the four caste groups were small, both in private and in public health centres.

Demographic differentials in OOP expenditure

The demographic differentials in OOP expenditure on delivery care are presented with respect to the age of the woman, birth order of the child, sex of the child and place of residence. For India and Tamil Nadu, OOP expenditure increased with women's age (both in private and in public health centres), whereas in Uttar Pradesh it did not show any pattern. OOP expenditure on delivery care declined with birth order for India and both the states. The differentials in OOP expenditure on delivery by sex of the child showed that it was marginally higher in the case of male babies compared with females, across the states and the place of delivery.

OOP expenditure and time

To understand OOP expenditure on delivery care over time, we present the cost of delivery care at constant prices (2004) and at market prices (as reported by women). We found that OOP expenditure at constant prices has declined over time (2004–08), particularly in public health centres in the country. This is an encouraging sign and is possibly due to increased

Table 3 Socio-economic differentials in out-of-pocket (OOP) expenditure in public and private health centres in India, Uttar Pradesh and Tamil Nadu, 2004–08, at 2004 prices

Background characteristics	Mean OOP expenditure on delivery in US$ (2004 prices)					
	India		Uttar Pradesh		Tamil Nadu	
	Public	Private	Public	Private	Public	Private
Age of the mother (years)						
15–24	35	125	29	105	17	146
25–34	42	148	34	104	19	163
35+	42	158	27	101	21	192
Birth order of the last child						
1	46	156	36	122	22	167
2	38	141	33	105	18	156
3	30	116	30	94	14	138
4	26	91	24	76	14	123
Sex of the last child						
Male	40	140	32	107	19	159
Female	38	138	30	100	18	158
Place of residence						
Rural	37	121	29	97	18	152
Urban	42	160	43	123	19	166
BPL card						
No	40	142	33	108	19	159
Yes	36	128	25	86	17	148
Caste of the woman						
Scheduled caste	34	118	22	85	16	135
Scheduled tribe	32	123	27	87	12	139
Others	42	143	33	107	20	163
Delivery complications						
No complication	35	138	26	95	14	139
One complication	40	142	28	96	26	190
Two or more complications	42	139	36	114	25	177
JSY beneficiary						
Yes	29	123	19	84	20	140
No	43	135	35	105	18	163
Borrowed money						
No	33	133	27	95	11	138
Yes	51	152	37	114	33	183

spending by the central government under the NRHM. Such spending might have improved availability of drugs and facilities in public health centres and thus reduced OOP expenditure on delivery (Figure 8a). Another reason could be the slow increase in drug prices compared with the general price level over time. However, OOP expenditure at market prices in public health centres has declined marginally in Uttar Pradesh and varies across a narrow range in Tamil Nadu (Figure 8b).

Determinants of cost

Table 4 shows the regression results of a two-part model and predicted expenditure on delivery care. The results of the logit regression show that the probability of incurring expenditure on delivery care is negatively associated with the age of women. Women aged 25–34 were less likely to spend on delivery care compared with women aged 15–24. Similarly, expenditure on delivery care decreases for higher order births. For example, the conditional expenditure was 30% less for 4th order births compared with first order births. Both the probability and conditional expenditure on delivery care increases with the level of women's education. The probability of expenditure incurred on delivery care is about 21% more among women with education up to high school, compared with illiterate women. In comparison with public health centres, the conditional expenditure in private health centres is 95% higher. Those who possessed BPL cards were 5% less likely to spend on delivery care, compared with those who did not. Caesarean delivery was

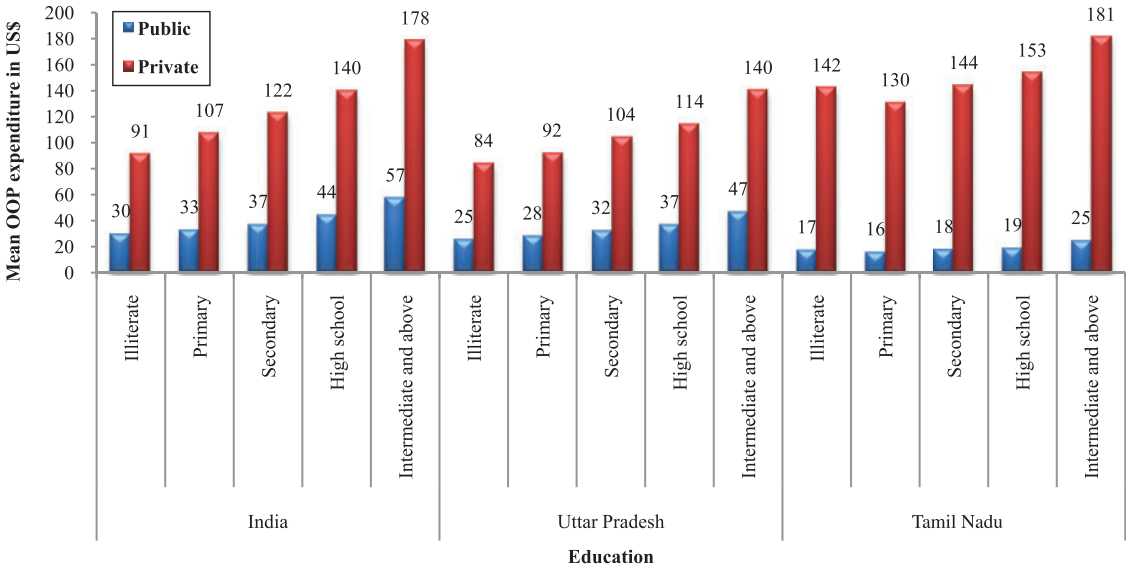

Figure 7 Mean out-of-pocket expenditure (US$) on delivery by education of women in public and private health centres in India, Uttar Pradesh and Tamil Nadu

associated with increased probability and increased level of expenditure on delivery care. With an increase in the economic status of women, the propensity and rate of expenditure on delivery increased. Controlling for other confounders, women who belonged to the richest quintile incurred 51% more expenditure on delivery care compared with women in the poorest quintile.

The mean expenditure has declined over time. The predicted mean expenditure in a private health centre (US$175) was four times higher than that in a public health centre (US$42). On average, the predicted expenditure for a caesarean delivery was almost six times higher than for a normal delivery. The predicted health expenditure for the poorest quintile of women was US$27 and that of the richest quintile of women was US$114.

Discussion

Despite concerted efforts by central government, state government, non-government organizations, bilateral and multi-lateral donors, about half of the deliveries in India are not assisted by a health professional and many of these deliveries are unsafe. Empirical evidence from large-scale population-based surveys in India suggests that a substantial proportion of women reported the cost of services as the reason for not using them (IIPS and Macro International 2007; IIPS 2010). Research studies agree that cost is a major barrier for poor households to access maternal care (Frenk 2006; Su *et al*. 2006; Bonu *et al*. 2009; Skordis-Worrall *et al*. 2011). However, there has been no systematic attempt to understand the cost differentials in delivery care in India. In this context, this paper examines the cost differentials in institutional delivery by private and public health centres in states of India.

We have some interesting findings. Most notably, the use of delivery care and the mean OOP expenditure in public health centres varies significantly among the states. Not only are half of the deliveries in Tamil Nadu conducted in public health centres, but the mean OOP expenditure for a delivery in a public health centre in the state is the lowest in the country—lower than that in the poorly performing states of Uttar Pradesh, Bihar and Madhya Pradesh. We put forward three plausible explanations for these discrepancies. First, health is a state subject and the budget allocation (health) of each state varies significantly. The differentials in the cost of delivery in public health centres across the states may be due to differentials in the cost of medicine, food and nominal bed charges, informal fees and the variation in prices across the states. The mean public health expenditure in Tamil Nadu is significantly higher than that in Uttar Pradesh and this is also true for maternal care. Second, the use of health services in Uttar Pradesh is possibly lower due to non-availability of facilities at public health centres. Though public health centres exist, often they are not adequately equipped. For example, 64% of primary health centres (PHCs) in Tamil Nadu had a newborn care unit compared with 15% in Uttar Pradesh. Similarly, 90% of PHCs in Tamil Nadu had a functional operating theatre, 87% had cold chain equipment and 62% had referral services for delivery, compared with 45%, 21% and 31%, respectively, in Uttar Pradesh (IIPS 2010). Third, within public health centres a significant proportion of deliveries in Tamil Nadu were conducted at sub-centres and PHCs, whereas a significant proportion of deliveries in Uttar Pradesh were conducted at the district hospital. The cost of delivery in district hospitals is higher than in sub-centres and PHCs.

The mean OOP expenditure on delivery was found to be higher among women with higher education and those belonging to a higher wealth quintile across the states. This is because women with higher socio-economic status demand better quality health care and they have the ability to pay higher prices. Delivery in a private health centre is about 3–4 times more expensive than in a public health centre.

We found that the mean OOP expenditure on delivery care (at 2004 prices) declines over time in public health centres.

Table 4 Regression results and predicted out-of-pocket expenditure on delivery care from a two-part model

Background characteristics	β (Logit)	Confidence interval	β (OLS)	Confidence interval	Predicted health expenditure
15–24					60
25–34	−0.085**	(−0.134, −0.036)	0.069**	(0.053, 0.084)	77
35+	−0.085	(−0.182, 0.012)	0.126**	(0.093, 0.159)	78
1st birth order					91
2nd birth order	−0.080**	(−0.131, −0.028)	−0.118**	(−0.133, −0.102)	71
3rd birth order	0.005	(−0.060, 0.069)	−0.205**	(−0.226, −0.184)	45
4th birth order	0.045	(−0.026, 0.117)	−0.300**	(−0.325, −0.275)	28
2004					80
2005	0.017	(−0.058, 0.092)	−0.023	(−0.047, 0.001)	74
2006	0.030	(−0.042, 0.101)	−0.070**	(−0.093, −0.047)	69
2007	0.001	(−0.071, 0.072)	−0.088**	(−0.110, −0.065)	67
2008	0.010	(−0.079, 0.098)	−0.163**	(−0.192, −0.134)	59
Boy					72
Girl	0.023	(−0.017, 0.064)	−0.039**	(−0.052, −0.026)	67
Rural					50
Urban	0.398**	(0.339, 0.457)	0.256**	(0.239, 0.272)	106
Illiterate					31
Primary	0.109**	(0.059, 0.159)	0.070**	(0.051, 0.088)	46
Secondary	0.230**	(0.171, 0.288)	0.144**	(0.124, 0.164)	75
High school	0.308**	(0.219, 0.398)	0.214**	(0.188, 0.239)	108
Intermediate and above	0.065	(−0.048, 0.178)	0.303**	(0.274, 0.331)	168
Public					42
Private	2.283**	(2.138, 2.427)	0.950**	(0.931, 0.968)	175
Others	−1.016**	(−1.071, −0.961)	−0.629**	(−0.647, −0.610)	11
BPL card					
No					76
Yes	−0.056*	(−0.102, −0.010)	−0.006	(−0.021, 0.010)	52
Delivery complications					
No complication	0.133**	(0.084, 0.183)	−0.009	(−0.025, 0.006)	68
One complication	0.209**	(0.158, 0.259)	0.018*	(0.002, 0.034)	73
Two or more complications					68
Normal delivery					38
Caesarean delivery	0.194**	(0.086, 0.302)	0.991**	(0.971, 1.011)	237
JSY beneficiary					
Yes					50
No	0.020	(−0.055, 0.095)	−0.123**	(−0.144, −0.102)	72
Borrowed money					106
Not borrowed money	2.644**	(2.533, 2.755)	0.458**	(0.444, 0.473)	57
Poorest					27
Poor	0.201**	(0.129, 0.274)	0.109**	(0.082, 0.135)	41
Middle	0.231**	(0.161, 0.302)	0.210**	(0.184, 0.236)	53
Rich	0.418**	(0.344, 0.491)	0.330**	(0.303, 0.357)	73
Richest	0.644**	(0.562, 0.727)	0.513**	(0.485, 0.542)	114
North					85
Central	−0.302**	(−0.372, −0.231)	−0.339**	(−0.360, −0.317)	42
East	0.349**	(0.262, 0.436)	−0.189**	(−0.211, −0.166)	55
North Eastern	−0.953**	(−1.021, −0.885)	−0.080**	(−0.104, −0.056)	36
West	−0.458**	(−0.543, −0.372)	−0.127**	(−0.151, −0.102)	73
South	−1.077**	(−1.168, −0.986)	0.014	(−0.008, 0.036)	127

**$p < 0.01$, *$p < 0.05$.

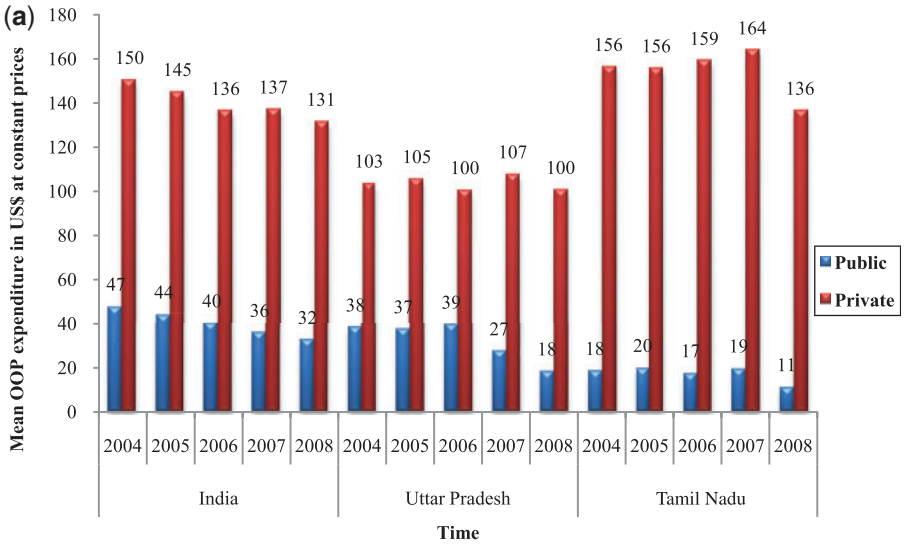

Figure 8(a) Mean out-of-pocket expenditure (US$) on delivery care at 2004 prices in public and private health centres in India, Uttar Pradesh and Tamil Nadu

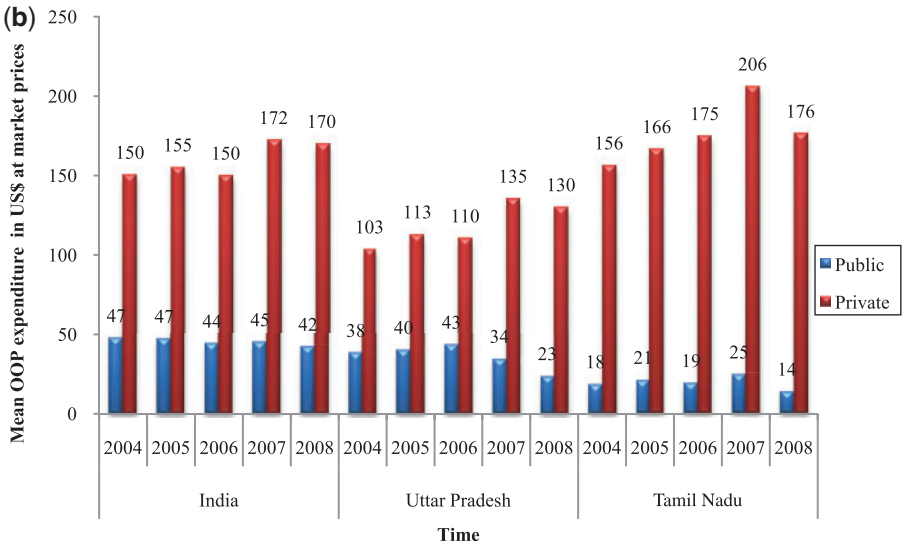

Figure 8(b) Mean out-of-pocket expenditure (US$) on delivery care at market prices in public and private health centres in India, Uttar Pradesh and Tamil Nadu

This is an interesting finding. We believe that the increased spending under the NRHM led to a decline in average OOP expenditure. This is an area needing further research. Expenditure under the NRHM has increased significantly, which might have helped to improve the facilities and availability of drugs in public health centres and reduce OOP expenditure on delivery care. Some private health centres are accredited under the JSY scheme, which might have led to a reduction in OOP expenditure in private health centres. The charges in government health centres are minimal and not revised often.

Though the mean OOP expenditure for those delivering in a public health centre is lower than that for private centres, it is significantly higher than the current cash assistance (low performing states: US$31in rural and US$22 in urban areas; high performing states: US$15 in rural areas and US$13 in urban areas). Moreover, if the delivery is a caesarean, the OOP expenditure is six times higher than for normal deliveries and the incentives provided for delivery care. Some studies suggests that although the JSY has increased institutional delivery significantly, the poorest and the least educated women are not always those most likely to receive the benefit, and there is

therefore a need to target maternal care utilization among the poorest women (Lim *et al*. 2010).

Improvements in health infrastructure, health personnel and public–private partnership will increase institutional delivery in the poorly performing states. Some public–private partnership models are being implemented to reduce the OOP expenditure on delivery care. For example, the Government of Gujarat is implementing the Chiranjeevi Scheme (CS) to improve institutional delivery and emergency obstetric care for poor and marginalized women. The CS, based on public–private partnership model, was launched as a pilot project in December 2005 in five districts of Gujarat (Bhat *et al*. 2007) and has been extended to the entire state. Studies suggest that the CS scheme is highly effective in reducing the OOP cost of delivery (reduction of US$82 per delivery), improving the coverage of institutional delivery and increasing client satisfaction (Bhat *et al*. 2009).

Based on these findings we suggest that, firstly, the cash incentives under the JSY programme should continue as it has been successful in increasing the institutional delivery and reducing OOP expenditure on delivery care in public health centres. Second, there is a need to improve the facilities in the primary health centres of poorly performing states so as to reduce the overcrowding in district/community health centres. Third, despite higher OOP expenditure in private health centres, deliveries at private health centres are likely to increase in coming years. It is difficult for the poor to afford these services, particularly complicated caesarean deliveries. Hence we suggest that the incentives under the JSY programme for caesarean delivery are increased, and that the cost of delivery in private health centres is regulated so as to reduce the economic burden on poor households.

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Conflict of interest

None declared.

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Appendix 1 Mean out-of-pocket expenditure on delivery care by type of provider, pregnancy type and transportation cost in states of India at 2004 prices, 2004–08

States	Type of delivery and mean OOP expenditure in public and private health centres												Mean transportation cost to public and private centres				Ratio of mean cost in private to public health centres for a		
	Normal delivery				Caesarean delivery				Either normal or caesarean delivery								Normal delivery	Caesarean delivery	Either normal or caesarean delivery
	Public		Private		Public		Private		Public		Private		Private		Public				
	Mean OOP exp (US$)	CV	Mean OOP exp (US$)	CV	Mean OOP exp (US$)	CV	Mean OOP exp (US$)	CV	Mean OOP exp (US$)	CV	Mean OOP exp (US$)	CV	Mean OOP exp (US$)	CV	Mean OOP exp (US$)	CV			
Andhra Pradesh	36	1.5	101	1.1	92	0.9	231	0.6	48	1.4	166	0.9	3	2.1	4	1.6	2.8	2.5	3.5
Assam	29	1.3	89	0.9	100	1.3	308	0.7	41	1.7	187	1.0	10	4.5	17	2.9	3.1	3.1	4.6
Bihar	16	1.5	53	1.2	68	1.4	173	0.9	21	1.8	91	1.3	4	1.3	6	2.3	3.2	2.6	4.4
Chhattisgarh	20	1.7	76	0.8	99	1.0	233	0.6	34	1.8	141	0.9	7	1.4	9	1.8	3.9	2.4	4.2
Gujarat	22	1.6	59	1.2	71	1.6	224	0.8	26	1.9	92	1.3	4	1.8	5	1.9	2.7	3.1	3.5
Haryana	44	2.4	103	1.1	121	1.2	253	0.8	59	2.0	148	1.1	5	1.3	5	2.2	2.4	2.1	2.5
Himachal Pradesh	44	1.0	124	0.9	118	0.9	270	0.7	61	1.2	202	0.9	14	1.6	16	1.6	2.8	2.3	3.3
Jammu & Kashmir	49	0.9	87	0.9	110	0.8	214	0.7	67	1.0	137	1.0	11	4.1	11	1.6	1.8	1.9	2.0
Jharkhand	24	1.6	63	0.9	78	1.1	206	0.8	33	1.6	109	1.1	6	1.4	9	1.9	2.6	2.6	3.3
Karnataka	28	1.2	86	1.0	93	1.0	267	0.7	39	1.4	139	1.0	4	2.0	5	2.0	3.1	2.9	3.6
Kerala	56	0.9	124	0.7	116	1.0	300	0.6	74	1.1	188	0.8	4	1.4	3	1.5	2.2	2.6	2.5
Madhya Pradesh	22	1.7	87	1.3	100	1.4	279	0.7	27	2.0	148	1.1	7	4.4	9	4.0	3.9	2.8	5.4
Maharashtra	22	1.6	79	1.3	89	1.0	278	0.6	30	1.7	123	1.2	4	1.9	4	1.7	3.6	3.1	4.2
Orissa	38	1.2	74	0.9	90	1.3	186	0.9	52	1.5	125	1.1	10	2.1	14	2.5	1.9	2.1	2.4
Punjab	40	0.8	67	0.6	136	1.3	243	0.6	62	1.2	115	1.0	4	1.5	5	1.3	1.6	1.8	1.9
Rajasthan	26	1.1	60	0.9	127	0.8	222	0.8	33	1.6	91	1.2	6	1.3	7	1.7	2.3	1.7	2.8
Tamil Nadu	13	1.5	91	0.9	46	1.2	275	0.6	18	1.9	159	0.9	3	1.7	4	1.6	6.8	6.0	8.6
Uttar Pradesh	22	1.7	61	1.5	102	1.6	221	0.8	31	2.0	104	1.4	5	1.8	6	2.5	2.7	2.2	3.4
Uttarakhand	35	1.2	88	0.8	131	1.3	241	0.8	48	1.9	132	1.0	15	2.1	13	2.5	2.5	1.8	2.7
West Bengal	31	1.4	105	1.0	98	1.6	244	0.7	45	1.4	192	0.8	5	1.8	5	1.1	3.4	2.5	4.3
India	28	1.5	84	1.1	98	0.9	256	0.7	39	1.7	139	1.1	6	3.3	6	3.1	3.0	2.6	3.6

CV = Coefficient of Variation